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ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS IN CANADA'S EASTERN ARCTIC BIOGEOGRAPHIC REGION, 2015

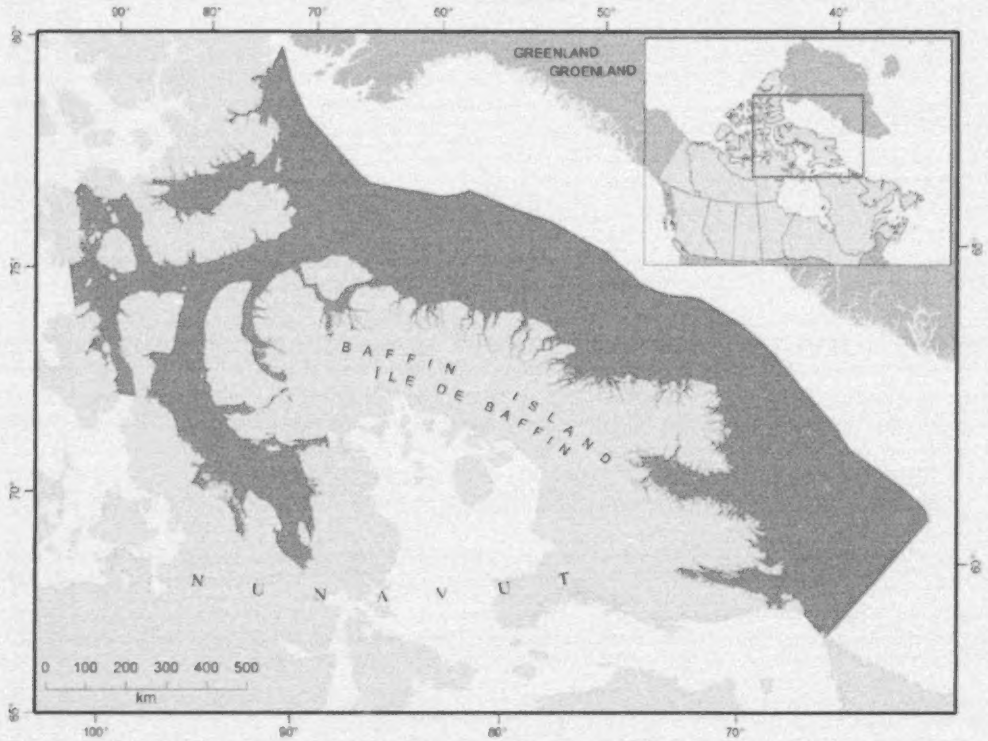

Figure 1. Canada's Eastern Arctic Biogeographic Region identified in colour.

Context:

The identification of Ecologically and Biologically Significant Areas (EBSAs) in the Canadian Arctic is an important step towards a more comprehensive management approach for the marine environment. EBSAs call attention to areas that have particularly high ecological or biological significance. Identification of EBSAs will address a variety of Federal Government commitments and will provide guidance for a number of regional planning initiatives. EBSAs are management tools used to provide information about important species, habitat and ecosystem components. Ocean areas can be ecologically or biologically "significant" because of the functions that they serve in the ecosystem and/or because of structural properties.

In 2011, Fisheries and Oceans Canada (DFO) identified EBSAs in the Canadian Arctic including in the Eastern Arctic Biogeographic Region. Since then, new information has been published and the process that DFO uses to identify EBSAs has evolved. DFO Science has been asked by DFO Oceans program to re-evaluate EBSAs in the Eastern Arctic Biogeographic Region to identify where key ecological features are located within each EBSA.

December 2015

Canada

SUMMARY

- Ecologically and Biologically Significant Areas (EBSAs), originally identified in 2011 in the Eastern Arctic Biogeographic Region, were re-evaluated in 2015 to refine/focus the EBSAs and better describe the underlying ecological properties of each area. The re-evaluation was based solely on ecological and biological properties of areas and did not consider threats and/or risks to them.
- The three EBSAs identified in Baffin Bay in 2011 were not re-evaluated. In a fourth, the Hatton Basin-Labrador Sea-Davis Strait EBSA, Frobisher Bay was removed and Cumberland Sound was separated into its own EBSA. The remainder of the area was not re-evaluated. Data are available for fishes, invertebrates, marine mammals and oceanographic conditions in the area, therefore EBSA revisions will be considered following data analysis.
- The Eastern Arctic Biogeographic Region currently contains 24 EBSAs, of which 20 resulted from this re-evaluation based on strict consideration of the three main EBSA criteria (uniqueness, aggregation and fitness consequences). These modified EBSAs are generally smaller and have more defined boundaries than the previous EBSAs and are based on their key ecological/biological features. Information on seasonality was also included.
- The following EBSAs were identified:
  - Clearwater Fiord which is an aggregation area with fitness consequences for the Cumberland Sound Beluga population;
  - Eastern Cumberland Sound which supports aggregations and fitness consequences for Cumberland Sound Beluga and Eastern Canada-West Greenland Bowhead Whale populations;
  - Cape Searle which is an aggregation area with fitness consequences for Northern Fulmar and Thick-billed Murre;
  - Isabella Bay which is an aggregation area with fitness consequences for the Eastern Canada-West Greenland Bowhead Whale population;
  - Scott Inlet which has a unique hydrocarbon seep and chemolithic biological community;
  - Eclipse Sound which supports aggregations and fitness consequences for the Eclipse Sound Narwhal summering stock (Baffin Bay Narwhal population);
  - Admiralty Inlet which supports aggregations and fitness consequences for the Admiralty Inlet Narwhal summering stock (Baffin Bay Narwhal population) and Northern Fulmar;
  - Prince Regent Inlet which is an aggregation area with fitness consequences for the Eastern Canada-West Greenland Bowhead Whale population and Somerset Island Narwhal summering stock (Baffin Bay Narwhal population);
  - Creswell Bay which is an aggregation area with fitness consequences for the Eastern High Arctic–Baffin Bay Beluga population;
  - Bellot Strait which is a unique migration corridor with fitness consequences for Somerset Island Narwhal summering stock (Baffin Bay Narwhal population) and the Eastern High Arctic–Baffin Bay Beluga population;

  - Gulf of Boothia which is an aggregation area with fitness consequences for the Eastern Canada-West Greenland Bowhead Whale population and the Somerset Island Narwhal summering stock (Baffin Bay Narwhal population);
  - Peel Sound which is an aggregation area with fitness consequences for the Somerset Island Narwhal summering stock (Baffin Bay Narwhal population);
  - Lancaster Sound which is an aggregation area for seabirds and migrating marine mammals with fitness consequences for them, along with high productivity and biological diversity;
  - Resolute Passage which is an area with fitness consequences associated with high ice algal biomass and benthic productivity;
  - Cunningham Inlet which is an aggregation area with fitness consequences for the Eastern High Arctic–Baffin Bay Beluga population;
  - Prince Leopold Island which is a unique multi-species aggregation area with fitness consequences for seabirds;
  - Penny Strait which is an aggregation area with fitness consequences for Ross's Gull and includes fitness consequences associated with increased primary and secondary production adjacent to the Dundas Island Polynya;
  - The North Water Polynya which is a unique polynya with aggregation and fitness consequences for marine mammals and seabirds, and fitness consequences associated with high biological productivity, benthic diversity and production;
  - Eastern Jones Sound which is an aggregation area with fitness consequences for Black-legged Kittiwake, Thick-billed Murre and staging seabirds; and
  - Cardigan Strait-Hell Gate which is an aggregation area with fitness consequences for the Western Jones Sound Atlantic Walrus stock (High Arctic Atlantic Walrus population).

- These EBSAs and their boundaries should be re-evaluated as new information becomes available. Boundaries were refined from the 2011 descriptions but should still be considered approximations.
- Most of the EBSAs identified are based on aggregations of marine mammals or seabirds, the most studied marine species groups in the Arctic. As more information is gathered about fishes and invertebrates, new EBSAs may be identified.

INTRODUCTION

The identification of EBSAs in the Canadian Arctic is an important step towards a more comprehensive management approach for the marine environment. EBSAs call attention to areas that have particularly high ecological or biological significance. Identification of EBSAs will, in part, address some Federal Government commitments (e.g., Arctic Council, United Nations Convention on Biological Diversity) and will provide guidance for a number of regional planning initiatives. EBSAs are a management tool used to provide information about important species, habitat and ecosystem components. EBSAs are primary inputs to Marine Protected Area Network designs.

In 2011, Fisheries and Oceans Canada (DFO) identified EBSAs in the Canadian Arctic including in the Eastern Arctic Biogeographic Region (Figure 1). Since then, new information from government and academic research has been published and the process that DFO uses to

identify EBSAs has evolved. In support of the National Conservation Plan (NCP), DFO Science was asked by DFO Oceans program to re-evaluate EBSAs in the Eastern Arctic Biogeographic Region to identify where key ecological features are located within each EBSA and to delineate/refine EBSA boundaries.

This Science Advisory Report (SAR) contains concise summary information including a description of EBSA boundaries and the key features used to identify each EBSA. Detailed scientific information supporting EBSA identification and full list of references can be found in the 2015 Research Document. The Proceedings (DFO 2015a) is a record of the meeting discussions.

ASSESSMENT

Eastern Arctic EBSAs identified in 2011 were re-evaluated based on three main criteria; uniqueness, aggregation and fitness consequences (DFO 2004). Resilience and naturalness (DFO 2004) were not used as criteria for evaluating EBSAs as they were considered more relevant for prioritizing rather than identifying EBSAs (DFO 2011a). The re-evaluation was based solely on ecological and biological properties of areas and did not consider threats and/or risks to them.

Seasonal extremes (e.g., sea-ice extent), inter-annual variability in oceanographic and climate conditions, seasonal use of areas by some marine mammal and bird species, and data limitation affected the identification of Arctic EBSAs and determination of their boundaries. The original EBSAs in this region are relatively large, and when combined, cover about 85% of the marine biogeographic region. The current approach to identify EBSAs was influenced by a better understanding of how EBSAs are being used by managers (e.g., to determine areas of concern, land use planning initiatives).

Each of the original EBSAs was re-evaluated to see if they met the EBSA criteria and if so, whether they could be subdivided into smaller, more focused EBSAs based on new information. During the re-evaluation, it was important to consider that information sources may be clustered in space for logistical reasons (i.e., ease of access), particularly in the Arctic, and this could provide a biased view of the uniqueness of well-sampled areas. Information on data used to identify EBSAs and their boundaries were included. Information on seasonality was also included as this information may be relevant to management initiatives.

Eastern Arctic Bioregion EBSAs

The 2015 Eastern Arctic EBSA peer-review identified 20 EBSAs in the Eastern Arctic Biogeographic Region (Figure 2). A summary of the boundaries and key ecological/biological features used to identify each EBSA is provided. EBSA boundaries should be considered approximations. They generally followed the coastlines and where appropriate, included lines between points of land to be distinguishable on a map. Ecological significance should not necessarily be attributed to the exact position of the lines chosen.

EBSAs from DFO (2011b) in Baffin Bay, Davis Strait and the Hatton Basin were re-evaluated to a limited extent: Frobisher Bay was removed from the 2011 Hatton Basin-Labrador Sea-Davis Strait EBSA and two EBSAs were identified within Cumberland Sound (Clearwater Fiord and Eastern Cumberland Sound). Three EBSAs were identified within the Baffin Island Coastline EBSA (Scott Inlet, Isabella Bay and Cape Searle). The remainder of the Hatton Basin-Labrador Sea-Davis Strait, Baffin Bay Shelf Break, Southern Baffin Bay, and Northern Baffin Bay EBSAs (Figure 2 greyed areas) remain as identified in DFO (2011b). These areas require a more thorough data-mining exercise, principally using the DFO multi-species bottom trawl survey data to better evaluate species diversity and focus EBSA boundaries. This will be completed through

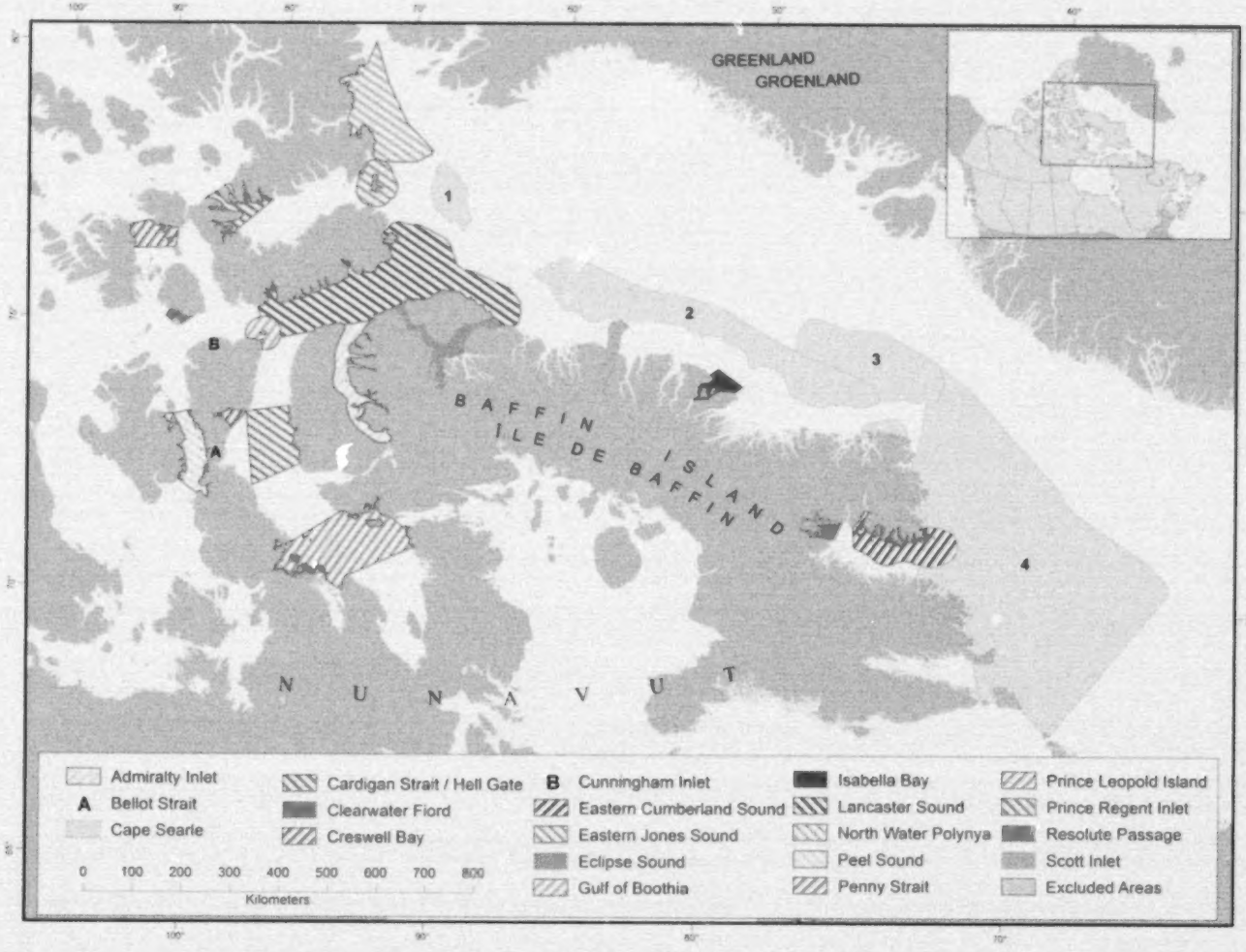

Figure 2. Ecologically and Biologically Significant Areas (EBSAs) in Canada's Eastern Arctic Biogeographic Region following a re-evaluation in 2015. Grey coloured EBSAs 1 to 4 are from DFO (2011b) and were not re-evaluated except for small changes made to the western edge of EBSA 4.

a separate peer review process that may be done in a manner similar to that of the Newfoundland and Labrador Shelves Bioregion EBSA assessment (DFO 2013a).

Clearwater Fiord

Clearwater Fiord was identified as an EBSA based on summer use by the Cumberland Sound Beluga (*Delphinapterus leucas*) population. The EBSA has been renamed Clearwater Fiord to focus on the only summering area where this genetically distinct population is found. The population lives year-round within Cumberland Sound.

Aggregation:

- Beluga from late July to late September

Fitness Consequences:

- Beluga feeding and rearing

This area was reduced in size and re-named from the 2011 Cumberland Sound EBSA. The summer distribution area for this Beluga population (DFO 2009) was used to identify the EBSA boundaries. It was extended beyond Clearwater Fiord, where about 80% of the population is found in the summer, to include Kangilo Fiord where the remainder of the population aggregate. The eastern boundary for this EBSA extends across the sound from the unnamed headland just east of Aupaluktok Island (as the most conspicuous point on the northern shore) to the southern tip of Imigen Island, then straight into the shore.

This area would also encompass open-water feeding habitat for Arctic Char (*Salvelinus alpinus*) from several char runs in the area. DFO (2011b) also identified this area as being important for seabird feeding, nesting and foraging. The area identified encompasses some portion of this important seabird habitat.

Eastern Cumberland Sound

The east end of Cumberland Sound, where a polynya forms, was identified as a separate EBSA for overwintering aggregations of Cumberland Sound Beluga and year-round use of the area by the Eastern Canada-West Greenland Bowhead Whale (*Balaena mysticetus*) population.

Aggregation:

- Beluga from December to May
- Bowhead Whale year-round

Fitness Consequences:

- Beluga feeding and over-wintering habitat
- Bowhead Whale feeding

This area was separated from the 2011 Hatton Basin-Labrador Sea-Davis Strait EBSA. The boundaries of the Eastern Cumberland Sound EBSA were based largely on the Cumberland Sound Beluga population distribution data (Richard and Stewart 2009) which was extended into Kingnait Fiord to include important summer habitat for Bowhead Whale.

The EBSA boundaries run from the western side of the mouth of Kingnait Fiord out to the 500 m isobaths and across to meet the 75 percentile fixed-kernel range estimates for the February distribution of tagged Cumberland Sound Beluga (Richard and Stewart 2008).

This EBSA would also encompass areas used by other marine mammals including Harp Seal *(Pagophilus groenlandicus)*, Ringed Seal (*Pusa hispida*), Narwhal (*Monodon monoceros*) and

Atlantic Walrus (*Odobenus rosmarus rosamarus*). This is a productive marine area that supports a Greenland Halibut *(Reinhardtius hippoglossoides*) fishery. It is important bird feeding and staging habitat, and Polar Bear (*Ursus maritimus*) habitat. The EBSA extends around the end of the Cumberland Sound Peninsula and includes Hoare Bay, which is an important area for Polar Bear and Atlantic Walrus.

Cape Searle

Cape Searle was identified as an EBSA based on the presence of the largest nesting colony of Northern Fulmar (*Fulmarus glacialis*) in Canada (22% of the Canadian population) and one of the largest nesting colonies of Thick-billed Murre (*Uria lomvia*) in Canada (10% of the Canadian population) (Mallory and Fontaine 2004).

Aggregation:

- Northern Fulmar from mid-April to early October
- Thick-billed Murre from late May to late-August

Fitness Consequences:

- Northern Fulmar nesting and foraging
- Thick-billed Murre nesting and foraging

This area was separated from the 2011 Baffin Island Coastline EBSA. The boundaries of the Cape Searle EBSA are based on the area identified as Key Marine Habitat (Mallory and Fontaine 2004) and generally follow a 15 km radius around the Qaqulluit Northern Fulmar colony and a 30 km radius around the Akpait Thick-billed Murre colony. The EBSA encompasses both the Qaqulluit and Akpait National Wildlife Areas established by Environment Canada in 2010 to protect these colonies.

The area is also an important nesting area for other seabirds including Black-legged Kittiwake (*Rissa tridactyla*), Black Guillemot (*Cepphus grille*), Glaucous Gull (*Larus hyperboreus*) and Iceland Gull (*Larus glaucoides*). There may also be some nesting Atlantic Puffin (*Fratercula arctica*). It is considered important habitat for Atlantic Walrus and Ringed Seal. Polar Bear may use the area.

Isabella Bay

Isabella Bay was identified as an EBSA based on Bowhead Whale feeding aggregations. The area is regularly used by the Eastern Canada-West Greenland Bowhead Whale population particularly in late summer/early fall. High densities of Bowhead Whale, mostly adults or subadults, have been observed in this area.

Aggregation:

- Bowhead Whale from August to October

Fitness Consequences:

- Bowhead Whale feeding

This area was separated from the 2011 Baffin Island Coastline EBSA. The boundaries for the Isabella Bay EBSA are based on the Ninginganiq National Wildlife Area established by Environment Canada in 2010. The National Wildlife Area includes the shoreline and islands of Isabella Bay and adjacent ocean out to 12 nautical miles from shore.

The area is frequented by Ringed Seal, Narwhal and Polar Bear and it provides habitat for seabirds (e.g., King Eider, *Somateria spectabilis*; Long-tailed Duck, *Clangula hyemalis*; Dovekies, *Alle alle*; Northern Fulmar).

Scott Inlet

Scott Inlet was identified as an EBSA based on its unique hydrocarbon seep and associated biological community. A naturally occurring seabed hydrocarbon seep was first observed in 1976 near Scott Inlet (Loncarevic and Falconer 1977). Gas has also been observed escaping from the seabed in remotely operated underwater vehicle (ROV) video footage collected onboard the *CCGS Amundsen* in 2009 and in acoustic water column data collected by the *CCGS Hudson* in 2013.

Scott Inlet is the only known cold seep along the East Baffin Island coast and harbors a chemolithic community. In 2014, a ROV expedition was conducted from the CCGS Amundsen which collected the first video images of fauna in the region. A predatory sponge *Claorhiza*, was reported and is indicative of chemolithic communities. This is the only report of this species in Baffin Bay or the Canadian Arctic to date.

Uniqueness:

- Hydrocarbon seep
- Chemolithic biological community

This area was separated from the 2011 Baffin Island Coastline EBSA. The Scott Inlet EBSA includes the Inlet itself and extends out from Cape Come Again (Qaqulluit Nuvua) seawards along the trough edge to the shelf break (including the deposition fan at the end of the trough) then back along the trough edge to the shore.

A number of other species, including concentrations of the anemone *Actinoscyphia aurelia*, soft corals in the family Nephtheidae, abundant sea pens (*Umbellula* sp.), and unstalked crinoids have been recorded, along with Redfish (*Sebastes* sp.) and the Spotted Wolffish (*Anarhichas minor*). Bacteria (genus *Beggiatoa*) have been observed covering the seabed. The inlet also supports an important colony of Northern Fulmars (5% of the Canadian population and almost entirely composed of light-phase birds, unusual for Canadian Eastern Arctic Fulmar colonies (Mallory and Fontaine 2004, Latour et al. 2008). This area is also likely used as a migration and staging site for various seabirds including Ivory Gull (*Pagophila eburnean*) and Black Guillemot. The extension out to the Baffin Bay shelf break captures a cross section of the Baffin Bay Narwhal migration corridor. The East Baffin Island summering stock of the Baffin Bay Narwhal population also use the inlet as a nursery area.

Eclipse Sound

Eclipse Sound was identified as an EBSA based on summering aggregations of the Eclipse Sound summering stock of the Baffin Bay Narwhal population and includes spring/fall Narwhal migration corridors between summering and overwintering areas. Aggregations of Narwhal were principally located in the Milne Inlet and Tremblay Sound areas. These areas may provide refuge from Killer Whale *(Orcinus orca)* which feed in Eclipse Sound.

Aggregation:

- Narwhal from July to mid-November

Fitness Consequences:

- Narwhal rearing
- Narwhal migration corridor

The boundaries of the Eclipse Sound EBSA identified in 2011 were extended to the mouth of Navy Board Inlet and Pond Inlet to accommodate these Narwhal migratory corridors. Inlets to the east of Milne Inlet along the south coast of Eclipse Sound were removed from the EBSA.

The sound is also used as a migration and staging site for various seabirds (e.g., Ivory Gull, Black-legged Kittiwake).

Admiralty Inlet

Admiralty Inlet was identified as an EBSA based on summer aggregations of the Admiralty Inlet summering stock of the Baffin Bay Narwhal population and a Northern Fulmar breeding colony (13% of the Canadian population) (Mallory and Fontaine 2004).

Aggregation:

- Narwhal from July to mid-September
- Northern Fulmar April through October

Fitness Consequences:

- Narwhal rearing
- Northern Fulmar nesting and foraging

The boundaries of the Admiralty Inlet EBSA were not changed from those identified in DFO (2011b).

Bowhead Whale aggregate and feed in this EBSA during the summer. Killer Whale also use the area during the open-water period. Admiralty Inlet is a breeding area for Glaucous Gull. From May to September, the area may have large aggregations of marine birds depending on the annual patterns of ice break-up and prey distribution (Gaston and Nettleship 1981 as cited by Mallory and Fontaine 2004). Polar Bear use the area in the summer.

Prince Regent Inlet

Prince Regent Inlet was identified as an EBSA based on Eastern Canada–West Greenland Bowhead Whale population and the Somerset Island summering stock of Baffin Bay Narwhal summer use.

Aggregation:

- Narwhal from July to mid-November
- Bowhead Whale from July to mid-November

Fitness Consequences:

- Narwhal rearing
- Bowhead Whale feeding and rearing

This area was separated from the 2011 Prince Regent Inlet/Somerset Island EBSA. The Prince Regent Inlet EBSA identified in 2011 was reduced to focus on the Bowhead Whale aggregation area near the centre of the inlet. The western boundary generally follows the slope break. The northern limit of the EBSA was a line from the Fury Point on Somerset Island across to the

shore just south of the mouth of McBean Bay on Baffin Island. The southern limit followed a line from Cape Nordenskiold on Boothia Peninsula to Cape Fury on Baffin Island. The shoreline of Baffin Island forms the eastern boundary.

Creswell Bay

Creswell Bay was identified as an EBSA based on Eastern High Arctic–Baffin Bay Beluga use of the area.

Aggregation:

- Beluga from July and August

Fitness Consequences:

- Beluga rearing
- Beluga refugia from Killer Whale

This area was separated from the 2011 Prince Regent Inlet/Somerset Island EBSA. The boundary for the Creswell Bay EBSA crosses the mouth of the bay from Fury Point to Cape Garry.

Creswell Bay is also used by several species of marine birds including Common Eider (*Somateria mollissima*), King Eider, Black-legged Kittiwake and Northern Fulmar. It is also important for moulting seaducks. Anadromous Arctic Char from Stanwell Fletcher Lake migrate down the Creswell River annually to feed in Creswell Bay and along the Somerset Island coastline before migrating back to the lake to overwinter. Narwhal are present in the area most years and Ringed Seal and Polar Bear are found in this area.

Creswell Bay probably contributes to primary production by providing nutrient-laden water to Prince Regent Inlet area (Dueck and Ferguson 2009).

Bellot Strait

Bellot Strait was identified as an EBSA based on its use by the Somerset Island stock of the Baffin Bay Narwhal population and Eastern High Arctic–Baffin Bay Beluga as a migration corridor between Prince Regent Inlet and Peel Sound. The strait is considered a choke point funnelling migrating whales through a relatively narrow passage. It provides alternate access to Peel Sound. It is a secondary route for the whales to access Peel Sound.

Uniqueness:

- Choke point, migration corridor

Fitness Consequences:

- Narwhal migratory corridor in July and August
- Beluga migratory corridor in July and August

This area was separated from the 2011 Prince Regent Inlet/Somerset Island EBSA. The boundaries of the Bellot Strait EBSA are described by a line between Leask Point and Hepburn Point at the west end of the strait and lines between Smellie Point and the south end of Long Island, and from the north end of Long Island direct (i.e., shortest distance) to Somerset Island at the east end of the strait.

There is a recurrent polynya at Bellot Strait. Bellot Strait probably contributes significantly to primary production by providing inputs from Pacific waters into Prince Regent Inlet (Dueck and Ferguson 2009). Riewe (1992) identified Bellot Strait as a feeding site for a variety of seabirds

and waterfowl between May and October and it is a staging area during spring for eiders. The area is used by Arctic Char, Polar Bear, Ringed Seal, and Bearded Seal (*Erignathus barbatus*). Bowhead Whale may also move through the strait.

Gulf of Boothia

Gulf of Boothia was identified as an EBSA based on Bowhead Whale and Narwhal use.

Aggregation:

- Bowhead Whale from late June to mid-November
- Narwhal in July and August

Fitness Consequences:

- Bowhead Whale rearing and feeding area
- Narwhal rearing area
- Bowhead Whale and Narwhal seasonal refugia from Killer Whale

The Gulf of Boothia EBSA identified in 2011 was reduced in size centering on areas were Bowhead Whale and Narwhal aggregate based on recent survey and telemetry data (DFO 2015b, 2015c).

A line was drawn from Mathe Point (70°27' N, 88°37' W) on Baffin Island to Cape Margaret (70°9' N, 91°31' W) on Boothia Peninsula for the northern boundary of this EBSA. A line from Cape Crozier (69°25' N, 85°28' W) on Melville Peninsula to Cape Chapman on Simpson Peninsula formed the southern boundary. Pelly Bay seaward of the Harrison Islands was included in the EBSA as were Tom Bay and Lord Mayor Bay.

This area is also important for Polar Bear.

Peel Sound

Peel Sound was identified as an EBSA based on summer use of the area by a large portion of the Somerset Island summering stock of the Baffin Bay Narwhal population.

Aggregation:

- Narwhal in July and August

Fitness Consequences:

- Narwhal rearing and potentially feeding area

The Peel Sound EBSA identified in 2011 was reduced in size to focus on the Narwhal aggregation areas to the west of Bellot Strait. The 2013 high Arctic marine mammal survey results (DFO 2015b) support the importance of this area for Narwhal.

Beluga use the area but not to the same extent as elsewhere in the region.

Lancaster Sound

Lancaster Sound was identified as an EBSA based on its importance as a migratory corridor for several species of marine mammals (Beluga, Narwhal, Bowhead Whale, Atlantic Walrus, Harp Seal, Polar Bear) and as an important nesting, foraging and staging area for numerous seabirds (e.g., Thick-billed Murre, Black-legged Kittiwake, Northern Fulmar, Dovekie). The area is highly productive and biologically diverse.

Lancaster Sound itself is a major east-west waterway in the Canadian Arctic. The ice edge that forms across the sound and the shore leads and polynyas are important aggregation areas for marine mammals and seabirds. It is the eastern entrance to the North West Passage linking Barrow Strait and Viscount Melville Sound to the west, with Baffin Bay to the east.

Aggregation:

- Marine mammals from March to November
- Seabirds from May through September

Fitness Consequences:

- High productivity and biological diversity
- Marine mammal migratory corridor
- Seabird nesting, feeding and staging

This area was reduced in size from the 2011 Lancaster Sound EBSA. The boundaries of the Lancaster Sound EBSA are unchanged to the east. The extensions into Navy Board Inlet and Pond Inlet which were part of the 2011 EBSA are now within the Eclipse Sound EBSA. To the west, the Lancaster Sound EBSA now extends to the Prince Leopold Island EBSA, and from there to the north shore on Devon Island at Cape Hurd (west of Maxwell Bay).

This area also has the highest Polar Bear density in the Canadian Arctic (COSEWIC 2008).

Resolute Passage

Resolute Passage was identified as an EBSA based on high ice algal biomass.

Fitness Consequences:

- High ice productivity and biological diversity
- High ice algal biomass resulting in high benthic productivity from March to June

This area was separated from the 2011 Lancaster Sound EBSA. The southeastern boundary of the EBSA was identified by a line between Cheyne Point on Griffith Island and the most southerly point of the Prospect Hills on Cornwallis Island. Lines from the southwestern point at the entrance to Dyers Cove on Griffith Island to the northern tip of Somerville Island and then across to Claxton Point on Cornwallis Island forms the northwestern boundary. This encompasses the area where high ice algal biomass has been reported.

The southeastern boundary to the EBSA was identified by a line between Cheyne Point on Griffith Island and the eastern side of Assistance Bay on Cornwallis Island. Lines from the southwestern point at the entrance to Dyers Cove on Griffith Island to the northern tip of Somerville Island and then across to Claxton Point on Cornwallis Island forms the northwestern boundary.

Cunningham Inlet

Cunningham Inlet was identified as an EBSA based on Eastern High Arctic–Baffin Bay Beluga summer aggregations.

Aggregation:

- Beluga from July and August

Fitness Consequences:

- Beluga summer refugia from predators

This area was separated from the 2011 Lancaster Sound EBSA. The EBSA boundary was drawn across the mouth of the inlet.

Prince Leopold Island

Prince Leopold Island was identified as an EBSA based on seabird use. It is the largest multi-species aggregation of breeding seabirds in the Canadian Arctic (Gaston 2014). Northern Fulmar, Black-legged Kittiwake, Thick-billed Murre and Black Guillemot nest on Prince Leopold Island along with several other species. They use the area between May and September depending on ice break-up and prey availability. Many bird species make use of the open water leads that form near the island.

Uniqueness:

- Largest multi-species aggregation of breeding seabirds in the Canadian Arctic

Aggregation:

- Seabirds from May through September

Fitness Consequences:

- Seabird breeding, nesting, rearing, foraging, staging

This area was separated from the 2011 Lancaster Sound EBSA. A 30 km radius around Prince Leopold Island was used to delineate the EBSA. This is based on the foraging area for Black-legged Kittiwake and Thick-billed Murre (Mallory and Fontaine 2004).

Penny Strait

This EBSA was based on the largest nesting colony of Ross's Gull (*Rhodostethia rosea*) on the Cheyne Islands (Threatened on Schedule I of the *Species at Risk Act*). It also includes the Dundas Island polynya which supports primary and secondary production in adjacent waters. The EBSA has been renamed Penny Strait to better reflect the geographical extent of this EBSA.

Aggregation:

- Ross's Gull from late May to August

Fitness Consequences:

- Ross's Gull nesting and rearing
- Stimulation of increased primary and secondary production adjacent to the Dundas Island Polynya in fast ice or pack ice areas

The Wellington Channel EBSA identified in 2011 was reduced to cover the Dundas Island Polynya and the area around the Cheyne Islands where the largest known nesting population of Ross's Gull occur.

The northern boundary was formed by a line from Cape Kitson on Bathurst Island to Cape Allard on the Grinnell Peninsula of Devon Island. The south and east boundaries were delineated by a line from the Moses Robinson River delta on Bathurst Island to Fitzjames Point on Baillie-Hamilton Island, and then from Surprise Point on the island to Cape Simpkinson on Devon Island.

Atlantic Walrus, belonging to the Penny Strait–Lancaster Sound stock (DFO 2013b), occur and use several terrestrial haulout sites in summer in this EBSA (Stewart et al. 2013). In winter, some may overwinter in the Dundas Island Polynya while others migrate east through Lancaster

Sound (Shafer et al. 2013). The area is also important for Bearded Seal, Ringed Seal and Polar Bear. They use the polynya when Atlantic Walrus are not abundant but the main benefit of the polynya, particularly for Ringed Seal and Polar Bear, is in the stimulation of increased primary and secondary production in adjacent fast ice or pack ice areas (Stirling 1997).

North Water Polynya

The North Water Polynya was identified as an EBSA in 2011 based on it being the largest and most productive polynya in the Arctic. It is important for Beluga, Narwhal, Bowhead Whale, Ringed Seal and Bearded Seal. Harp Seal use the area during the open water season. Polar Bear rely on Ringed Seal in the fast ice adjacent to the polynya over the winter and spring. Some Beluga, Narwhal and Bowhead Whales may use the North Water as an overwintering area. Seabirds using the area include Dovekie, Thick-billed Murre, Black Guillemot, Black-legged Kittiwake, Ivory Gull, Glaucous Gull, and Northern Fulmar.

Uniqueness:

- Largest and most productive Canadian Arctic polynya

Aggregation:

- Marine mammals from March to July
- Seabirds from April to September

Fitness Consequences:

- Seabird feeding and staging
- Marine mammal feeding
- High biological productivity
- High benthic diversity and production

The boundaries of the North Water Polynya EBSA identified in 2011 were left unchanged. However, it was noted that the area to the north warrants consideration as an EBSA when EBSAs are re-evaluated in the Arctic Archipelago Biogeographic Region.

Eastern Jones Sound

Eastern Jones Sound was identified as an EBSA based on seabird use of the area. It includes the largest breeding colony of Black-legged Kittiwake in the Canadian Arctic (16% of Canadian population) and third largest Thick-billed Murre colony (12% of Canadian population) (Mallory and Fontaine 2004, Latour et al. 2008). Outside the breeding season, the ice edges around Coburg Island support thousands of seabirds from April through October (Latour et al. 2008).

Aggregation:

- Black-legged Kittiwake from late April to September
- Thick-billed Murre from late May to late-August

Fitness Consequences:

- Seabird nesting, foraging and staging

The boundaries of the Eastern Jones Sound EBSA identified in 2011 were reduced to a 30 km radius around Coburg Island based on the foraging radius of Black-legged Kittiwake and Thick-billed Murre (Mallory and Fontaine 2004). The EBSA encompasses and buffers the Nirjutiqavvik National Wildlife Area established by Environment Canada in 1995.

A recurrent area of open water occurs in the vicinity of Coburg Island. Atlantic Walrus haul out sites are located in this area and Polar Bear feed in the area. The area is frequented by Narwhal, Beluga, Ringed Seal and Bearded Seal. Other marine birds nest in this EBSA including Northern Fulmar, Black Guillemot, Common Eider, Ivory Gull, Glaucous Gull, and Long-tailed Duck. A small colony of Atlantic Puffin nest on Princess Charlotte Monument within this EBSA (Robards et al. 2000) making it the most northerly breeding site for Atlantic Puffin in Canada.

Cardigan Strait-Hell Gate

Cardigan Strait-Hell Gate was identified as an EBSA based on the use of the area by the Western Jones Sound Atlantic Walrus stock. A tidally driven polynya forms in Cardigan Strait and Hell Gate which allows the walrus stock to remain in this area year-round.

Aggregation:

- Atlantic Walrus year-round

Fitness Consequences:

- Walrus feeding and overwintering

The northwest boundary of the Cardigan Strait-Hell Gate EBSA identified in 2011 was changed to follow the entrance to both straits. Although the northern halves of Cardigan Strait and Hell Gate are in the Arctic Archipelago Biogeographic Region, they were included in this EBSA as they are integral to the EBSA. The southeast boundary was delineated by a line between the western side of the mouth of Baad Fiord and the south side of the mouth of Viks Fiord.

The polynya allows early access to feeding and nesting sites for the seabirds in the area. Large variability in the use of this area by nesting marine birds may be due to ice. Polar Bear feed in the area and the area is frequented by Narwhal, Ringed Seal and Bearded Seal.

Sources of Uncertainty

Scientific research is limited over much of the Eastern Arctic Biogeographic Region and data may be insufficient to identify some areas that are ecologically and biologically significant. As more information becomes available, further refinements may be needed to alter existing EBSAs or add additional ones.

Limited data are available on marine fishes and invertebrates. More data might lead to the identification of EBSAs focusing on their biodiversity and habitat use in the future.

Boundaries were more often than not chosen for convenience in describing the area rather than being based on data. As data become available these boundaries may need to be changed to better reflect ecosystem components.

CONCLUSIONS AND ADVICE

The Eastern Arctic Biogeographic Region currently contains 24 EBSAs, of which 20 resulted from this re-evaluation based on strict consideration of the three main EBSA criteria (uniqueness, aggregation and fitness consequences). These modified EBSAs are generally smaller and have more defined boundaries than the previous EBSAs and are based on their key ecological/biological features.

The Prince Leopold Island and North Water Polynya EBSAs met all three EBSA criteria. Clearwater Fiord, Eastern Cumberland Sound, Cape Searle, Isabella Bay, Eclipse Sound, Admiralty Inlet, Prince Regent Inlet, Creswell Bay, Gulf of Boothia, Peel Sound, Lancaster

Sound, Cunningham Inlet, Penny Strait, Eastern Jones Sound, and Cardigan Strait-Hell Gate EBSAs met the aggregation and fitness consequences criteria. Bellot Strait met uniqueness and fitness consequences criteria. Scott Inlet met the uniqueness criteria. Resolute Passage met the fitness consequences criteria.

The majority of EBSAs were identified based on aggregations of birds or marine mammals, the most visible and therefore studied Arctic marine species.

The Northern Baffin Bay, Baffin Bay Shelf Break, and Southern Baffin Bay EBSAs identified in 2011 were not re-evaluated. The Frobisher Bay and Cumberland Sound areas of the Hatton Basin-Labrador Sea-Davis Strait EBSA were re-evaluated. The extension of the EBSA into Frobisher Bay was removed and the extension into Cumberland Sound was divided into a separate Eastern Cumberland Sound EBSA. The remainder of the Hatton Basin-Labrador Sea-Davis Strait EBSA was not re-evaluated. These four EBSAs have data available for fishes, invertebrates, marine mammals and oceanographic conditions. These data should be fully examined and the EBSAs re-evaluated on the same basis as the other EBSAs in this bioregion.

Subject matter experts for seabirds and Polar Bear were not present at this peer-review. Published literature was used to support the identification of EBSAs where the criteria involved seabirds and Polar Bear. Information was verified for these areas with subject-matter experts. No EBSA was identified solely for Polar Bear but many of the areas identified as EBSAs are used by this species. EBSA evaluations should consider all components of the ecosystem for which we have information (i.e., including marine birds and Polar Bear) and not be limited to species that fall under the jurisdiction of DFO.

This EBSA process was not meant to identify Ecologically Significant Species (ESS). Throughout the discussions, ubiquitous, widely distributed and important species were identified that contribute to ecosystem structure and function (e.g., Arctic Char, Arctic Cod (*Boreogadus saida*), Ringed Seal). These species would be better evaluated against the ESS criteria (DFO 2006) which is a tool to call attention to a species that has particularly high ecological significance, to facilitate provision of a greater-than-usual degree of risk aversion in management of activities where these species are found. Although no EBSA was identified specifically for these species, many of the areas identified as EBSAs are used by these species.

Seasonality of use has been identified as a component of the aggregation criteria for each of the EBSAs. In some cases, while organisms may not be present in an area year-round, ecosystem integrity must be maintained for them to return to the area over the long term.

EBSA identification should be considered a living process, requiring re-evaluation as new information becomes available.

SOURCES OF INFORMATION

This Science Advisory Report is from the January 27-29, 2015 re-evaluation of Ecologically and Biologically Significant Areas (EBSAs) in the Eastern Arctic Biogeographic Region of the Canadian Arctic. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

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